

PATENT SPECIFICATION

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(54) PIPE JOINT

(71) I, WALTER SCHWARZ of Engerthstrasse 237B, A-1020, Vienna, Austria, of Austrian Nationality do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a pipe joint between a pipe of reinforced plastics and a second pipe which may be constructed of any kind of material.

Throughout his specification the term pipe is used to denote one of two hollow members joined to one another at the joint and such a pipe may have an extended length or a very short length, for example a pipe stub. In its preferred form the invention is used to provide a coupling between two axially aligned, spaced, extended pipe lengths. However the invention also has utility providing a pipe joint between a pipe end and an annular arrangement providing a pipe junction or pipe termination structure.

Sealing-tight pipe joints were always difficult to construct and costly, particularly in the case of pipes with very large diameters of 1 or more metres, and this is specially so if the pipe joint is also required to be pressure-tight.

In accordance with the present invention there is provided a pipe joint between an end of a first pipe of reinforced plastics and an oppositely facing end of a second pipe, in which the said end of the first pipe is built up *in situ* around and is bonded to the outside of a shouldered end portion of the second pipe so that separation of the two pipes from one another is resisted by the built up plastics material of the first pipe behind the shoulder.

It will be clear that the pipe joint according to the invention may be duplicated where two metal pipes, for ex-

ample two steel pipes, are to be joined to each other. Preferably the two joint positions are symmetrically arranged relative to the transverse median plane extending through the pipe of reinforced plastics.

The pipe of reinforced plastics, which in this case may also be described as a coupling member since each of its ends enters into a pipe connection, provides a connection of electrically insulating material. If two metal pipes are joined with such a coupling member the arrangement constitutes an electrically insulating pipe coupling.

The invention will now be described in more detail, by way of examples, with reference to the accompanying drawings, in which:—

FIGURE 1 shows in section part of a symmetrical annular pipe joint;

FIGURES 2 and 3 shows alternative configurations to that shown in Figure 1; FIGURES 4 and 5 show sections through parts of two different pipe joints which are both annular and symmetrical but in each case a socket is provided;

FIGURE 6 shows in section a part of a symmetrical annular pipe joint forming an integral part of a coupling member having such a joint at each end each of which terminates in a stub pipe enabling it to be welded; as shown, to a metal pipe;

FIGURE 7 shows in section part of a symmetrical annular pipe joint having the same inside and outside dimensions throughout; and

FIGURE 8 shows a section of an annular pipe joint which is strengthened in the vicinity of the junction position by an overlapping reinforcing sleeve.

In the description of the accompanying drawings like numerals are used for like parts which are not necessarily identical but nevertheless serve the same function. Thus throughout the two pipes, as above

defined, are referenced 1, 2 respectively and a surrounding projection or each projection formed on an overlapped portion of the pipe 2 is referenced 3.

- 5 In the pipe joint shown in Figure 1 an end-portion of a pipe 1 is constructed of reinforced plastics and is attached to the end of a second pipe 2 having a projecting collar 3, by being lapped over the
- 10 aforementioned end. The collar 3 provides a shoulder and may extend in a single radial plane or spirally around the pipe end. The hatching indicates that the lapping of the pipe 1 is coiled in layers.
- 15 In the manufacture of the pipe 1 by lapping, the strands of the reinforcing fibres are first drawn through a resin bath to produce the pipe wall of reinforced plastics when being coiled around a mandrel in
- 20 accordance with a pre-defined pattern. To produce the pipe joint the mandrel is replaced by the pipe 2 and the collar 3 is completely bonded during the coiling operation in to the pipe end of the plastics pipe 1. It is also possible to operate with pre-impregnated reinforcing fibres (prepregs) without a resin bath.

Any known coiling method may be used in manufacture, for example in the

30 circumferential orientation and/or helical with a linear or non-linear lapping programme.

Figure 2 relates to an embodiment in which the end of the second pipe 2 has its end-portion initially reduced in diameter by

35 the provision of a groove 5 and then having a projection portion formed by an annular part of the same diameter as the original pipe, which is separated by the groove 5 from the remainder of the pipe 2. The groove 5 is then filled by the lappings of the pipe 1 of reinforced plastics so that the projection 3 is locked into the pipe 1.

40 The groove 5 may have any desired section. As illustrated, it is of approximately rectangular cross-section with rounded corners. It may also be constructed in the manner of a circular trough, an oval trough or with an irregularly defined cross-section. It may also extend circumferentially or spirally around the pipe end.

50 According to Figure 3 the end of the second pipe has a zone of reduced thickness 6 and is also provided with grooves 5 and collars 3 or screwthreading turns (not shown) to provide projections over which the lappings are wound.

Figure 4 indicates the manner in which the pipe joint may be used for producing a reducer to which end the end-portion 6 of the pipe is expanded into a socket 4. The pipe 2 is reduced in the region of the socket 4 and is shouldered by having an annular groove and an adjoining collar 3 so

60 that the pipe end 1 of reinforced plastics is

firmly anchored on the end of the pipe 2 during manufacture.

By analogy it is possible to produce a reducer if the narrower end of a pipe constructed with a socket is covered, in a

70 manner not shown, by the end of the pipe constructed of reinforced plastics.

Lining pipes and pipe joints with a protective skin (liner) is known and is possible also with the invention, when the

75 liner is placed on the mandrel before the mandrel is lapped or sheathed with the reinforced plastics.

In the embodiment illustrated in Figure 5 the end of the pipe 2, thickened into a

80 socket, is surrounded by the pipe 1 of reinforced plastics which tightly fills a groove 5 which is recessed in the pipe 2 to provide a terminal projection 3. The internal surface of the plastics pipe is

85 provided with a protective skin 7 which also covers the internal surface of the line of contact between the two pipes in liquid-tight and gas-tight manner.

An embodiment according to Fig. 6 is

90 advantageous for an electrically insulating pipe coupling of pipes in a high-pressure pipeline of large nominal bore which may be under an operating pressure of 120 atmospheres pressure (gauge). A stub of the

95 second pipe 2, is expanded into a socket 4 the wall of which is initially thinned and has a collar 3 at its end. Packing extending as far as the internal diameter of the stub 2, is provided inside its socket 4. The external surface of the socket 4 with the exception of the end rim of the slightly undercut collar 3 and the adjoining surface of the packing are covered with a stratum of reinforced plastics lappings which provides

100 the pipe 1.

The packing of the pipe coupling may be constructed in any suitable manner and in the example shown comprises a number of strata 21 to 25 of which at least one is

110 constructed of an electrically highly insulating material such as mica chippings with polyester fibres and epoxy resin. It is advantageous for a high-pressure pipe coupling intended for a pipeline of large

115 nominal bore if the radially inner portions of the packing comprise a prefabricated coupling member 21 of reinforced plastics formed around a protective internal liner skin 22 which extends through a reinforcing sleeve 23 of steel.

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In the assembly of a pipe joint using the coupling member 21 it is initially forced and/or adhesively fixed at each end in the sockets 4 of two pipe stubs 2. This semi-finished assembly is then pushed over a

125 mandrel and the annular space between the socket ends is filled in layers with a crack-preventing stratum 24 and an insulation reinforcing stratum 25 separated by a

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laminated annular stratum of reinforced plastics material, and an outer stratum of reinforced plastics is finally applied over the sockets 4 and the afore-mentioned layers in one lapping operation as previously described.

The electrically insulated pipe coupling produced in the manner described hereinabove and assembled into an integral member is stored and may be welded into a pipeline, when required, as shown by the weld-filled V-notch.

Fig. 7 relates to a pipe joint whose thickness is identical with the thickness of the second pipe 2 so that the internal and external surface thereof is continued beyond the coupling position into the plastics pipe 1 without any interruption.

In this case the pipe 2 has an end 6 of thinner wall thickness providing a collar 3, and the interior of the pipe 1 is lined with a protective skin 7 of reinforced plastics.

The pipe joint according to Fig. 7 may be reinforced, as shown in Figure 8 where the pipe 2 is slightly differently constructed, by an extensively overlapping internally-threaded sleeve 9 for applications involving maximum pressures and in particular if the pipeline is exposed to severe temperature fluctuations, the said socket being pulled over the second pipe 1 and being shrunk or otherwise arranged to grip tightly on screwthreading 8 of the second pipe 2 after the plastics pipe 1 is produced. The sleeve 9 may of course be fixedly joined to the second pipe 2 by welding. The sleeve 9 may, if desired, be constructed of individual pipe parts, for example two half-shells, and the individual parts are then fixed to each other and to the second pipe 2 by welding after formation of the rest of the coupling.

Although in the illustrated examples described above the plastics pipe 1 is built up from superimposed turns the invention is not limited to this construction. The pipe 1 can, for example, be formed by extruding it or casting it over the end-portion of the pipe 2.

WHAT WE CLAIM IS:—

1. A pipe joint between an end of a first pipe of reinforced plastics and an oppositely facing end of a second pipe in which the said end of the first pipe is built up *in situ* around and is bonded to the outside of a shouldered end portion of the second pipe so that separation of the two

pipes from one another is resisted by the built up plastics material of the first pipe behind the shoulder.

2. A pipe joint according to claim 1, in which the second pipe has a screwthread or a collar formed on its end-portion and providing the shoulder.

3. A pipe joint according to claim 1 or 2, in which the end of the second pipe covered by the first pipe has at least one radial or spiral groove formed in it filled with reinforced plastics material of the first pipe and providing the shoulder.

4. A pipe joint according to any of the preceding claims, in which the end of the second pipe is expanded into the shape of a socket and the end of the first pipe covers the outside wall of the socket.

5. A pipe joint according to claim 4, in which the socket is filled with packing as far as the internal diameter of the second pipe.

6. A pipe joint according to claim 5, in which the packing is formed with at least two superimposed layers, at least one of which is made of a relatively high-tensile electrically-insulating material.

7. A pipe joint according to claim 6, in which the inner packing layer comprises a prefabricated coupling member of reinforced plastics lined internally with a protective skin and containing embedded within it a reinforcing sleeve of steel.

8. A pipe joint as claimed in any of the preceding claims, including a metal protection sleeve surrounding the region of the shouldered portion of the second pipe.

9. A pipe joint according to any of the preceding claims, in which the second pipe is formed of coiled layers.

10. A pipe joint according to any of claims 1 to 8 in which the second pipe is produced by extrusion of the end portion of the first pipe over the second pipe.

11. A pipe joint according to any of claims 1 to 8, in which the second pipe is produced by casting of the end portion of the first pipe over the second pipe.

12. A pipe joint substantially as described with reference to any one of the accompanying drawings.

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FIG.1

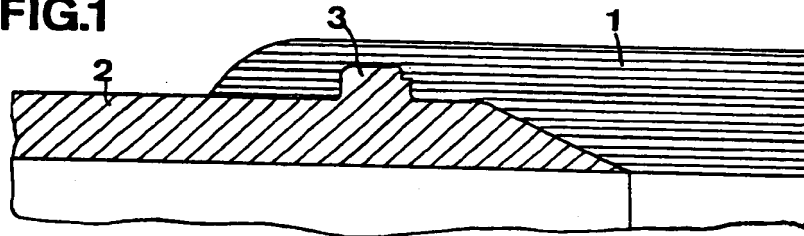


FIG.2

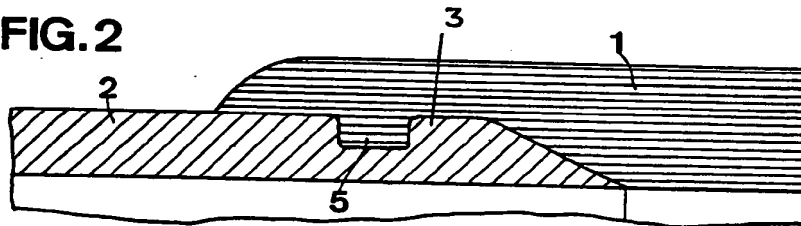


FIG.3

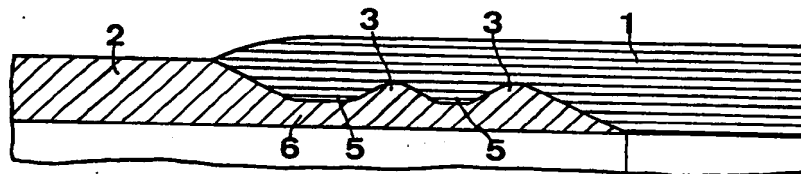


FIG.4

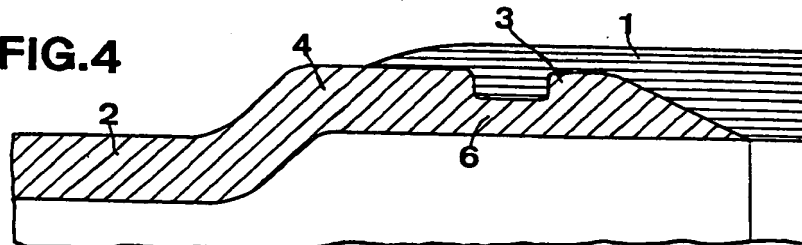


FIG.5

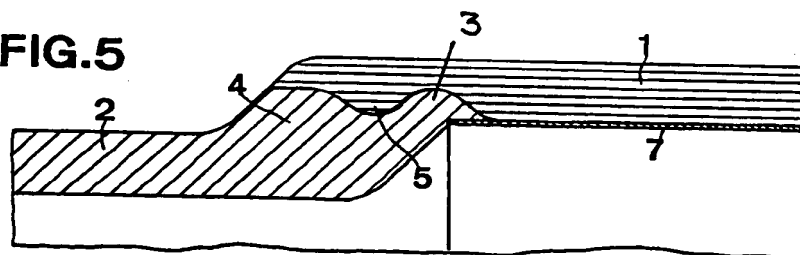


FIG.6

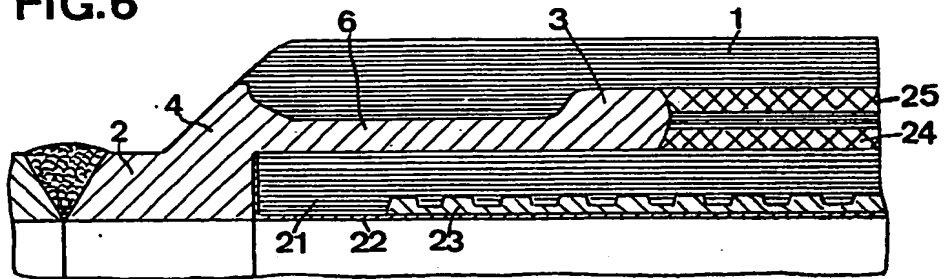


FIG.7

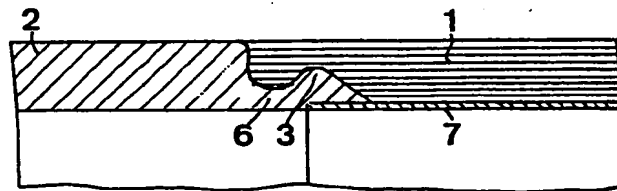
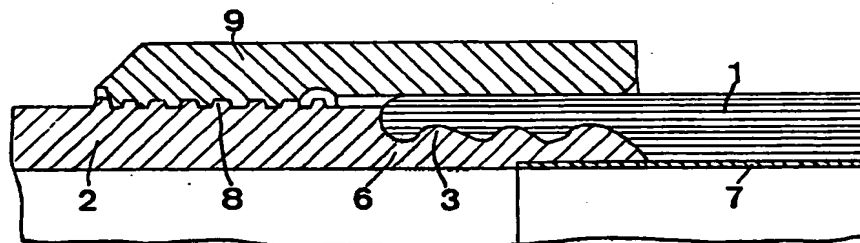


FIG.8



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